Performance Technologies

ZT 6301 and ZT 6311

CompactPCI® Power Supplies

User's and System Integrator's Guide

Revision History

Revision Date	Revision History
10/02/02	Initial Release
2/14/03	Updated format
7/18/03	Updated format, branding

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Errors and Omissions

Although diligent efforts are made to supply accurate technical information to the user, occasionally errors and omissions occur in manuals of this type. Refer to the Performance Technologies, Inc. Web site to obtain manual revisions or current customer information: http://www.pt.com.
Performance Technologies, Inc., reserves its right to change product specifications without notice.

Symbols and Conventions in this Manual

The following symbols appear in this document:

Caution: There is risk of equipment damage. Follow the instructions.

Warning: Hazardous voltages are present. To reduce the risk of electrical shock and danger to personal health, follow the instructions.

Electrostatic Discharge

Caution: Electronic components on printed circuit boards are extremely sensitive to static electricity. Ordinary amounts of static electricity generated by your clothing or work environment can damage the electronic equipment. It is recommended that anti-static ground straps and anti-static mats are used when installing the board in a system to help prevent damage due to electrostatic discharge.

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1 Introduction

This document explains the differences between older ZT 6300 and ZT 6310 power supplies and the new ZT 6301 CompactPCI® 3U Hot Swap AC Power Supply and ZT 6311 CompactPCI 3U Hot Swap DC Power Supply. Information is provided to aid in the use of and migration to the ZT 6301 and ZT 6311.

1.1 Guide-Rail Alignment

The guide rails on the ZT 6301 and ZT 6311 are offset 0.8 inches to the left relative to the guide rail on the ZT 6300 and ZT 6310. This may require field upgrades to unsnap and reseat card guides, depending on the placement of the card guides in the enclosure. No modifications are necessary for enclosures with formed card guides, or enclosures where all slots are populated with a card guides.

1.2 Dimensions - Supplies and Faceplates

Height, width, depth, and faceplate dimensions of the ZT 6301 and the ZT 6311 are identical to the ZT 6300 and ZT 6310. The ZT 6301 and ZT 6311 have handles, LEDs, and faceplate labeling in different locations from the previous power supplies.

Performance Technologies tests for insertion of these power supplies in enclosures yielded positive results. No mechanical interference problems should be anticipated. Supplies used in enclosures that conform to the IEEE 1101.10 specification achieve optimal results.

1.3 EMI

The ZT 6301 and ZT 6311 faceplates are gasketed to limit Electromagnetic Interference (EMI) radiation and improve performance.

1.4 Load Sharing

The ZT 6300 and ZT 6310 use "droop" current sharing on the +12V, -12V and the 3.3V lines. The "droop" mechanism involves one supply providing all the current until it can no longer meet the demands of the system. The other supplies join in to provide more current before the output falls out of regulation.

The ZT 6300 and ZT 6310 use "third-wire" current sharing on the +5V line when two or more supplies are used. The "third-wire" communicates differences between the supplies' outputs. A necessary interdependence exists between supplies for current compensation. Load and output adjustments between the supplies occur until both provide the current needed—balance between the supplies is the net result. A distinct disadvantage to this method is that it is a single point of failure for the system.

The ZT 6301 and ZT 6311 use programmed slope current sharing on the +3.3V, +5V and +12V outputs. Power supply outputs are highest at no load. As loads increase, the output voltages decrease in a linear fashion. Voltage compensation occurs between the supplies until all supplies in the system reach equilibrium. The ZT 6301 and ZT 6311 respond independently to meet system requirements rather than relying on a “third wire” communication mechanism. Each supply contributes to the management of power. This is achieved within a 1% tolerance band of the nominal voltage. The net result is a smoother load sharing. See the “Load Sharing Comparison” figure below.

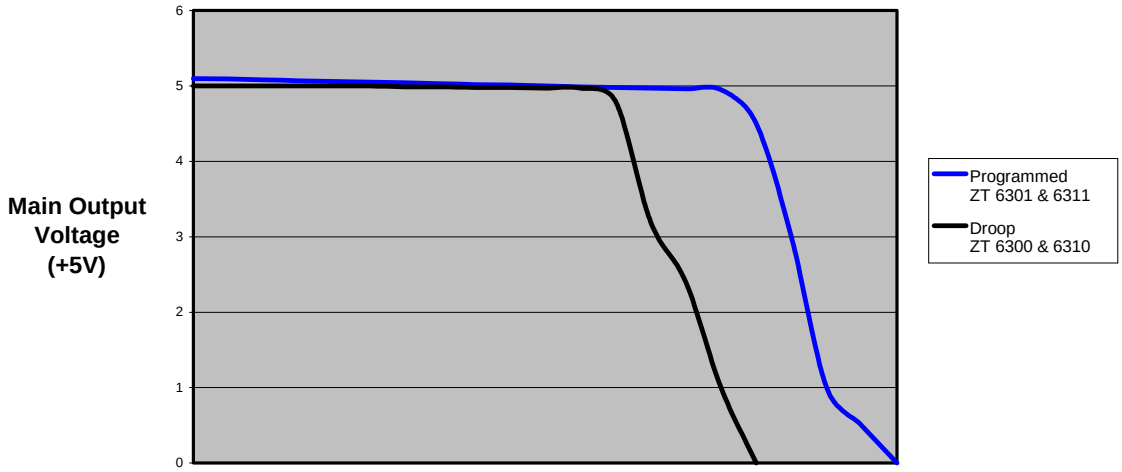


Figure 1. Load Sharing Comparison

1.5 Mixing and Matching ZT 6301/ZT 6311 with ZT 6300/ZT 6310 Supplies

1+1 Power Supply Combination - Paired "new" products (two ZT 6301s or two ZT 6311s) is the ideal combination of Performance Technologies power supplies. The load sharing is independently managed. Each supply dynamically contributes to the overall power demand. Their load range is greater. Their interaction is complementary by design. Mixed “new” product combinations (one ZT 6301, one ZT 6311) are also possible and work equally well, although this type of configuration is seldom employed.

Mixing of "new" and "old" supplies is another possible variation. Overall dimensions are compatible between the supplies for slot count and size. Guide rails may need to be adjusted for each product. The main drawback is that system balance is dependent on the old supply output with the new supply supplementing any shortfall. The set point (output voltage) of the old supply is the determining factor for the new supply response.

Although all combinations are possible, preference should be given to matching new supplies together. Mixing of the ZT 6300 and ZT 6310 (“old”) with the ZT 6301 and ZT 6311 (“new”) does have some limitations. Not only is load sharing less balanced, but hot swapping the new supplies with old supplies also installed in the system may cause a momentary output voltage drop. Load sharing and quiescent operation work well and remain unaffected. This limitation is related to the ZT 6300/ZT 6310 internal circuitry (the inhibit (INH#) line). Essentially, the ZT 6300/6310 may be momentarily disabled before the ZT 6301/ZT 6311 can power up. Please contact Performance Technologies before using mixed (old/new) power supplies in high availability systems.

1.6 Power Output

The new supplies offer greater power and flexibility to the user with the exception of the decrease in current on the -12V output. See the table below for output specifications of both the new and old supplies.

Table 1. Comparison of Supply Outputs

ZT 6301 and ZT 6311		**ZT 6300 and ZT 6310**	
Current @ +3.3V	20A[1]	Current @ +3.3V	3A
Current @ +5V	25A[1]	Current @ +5V	20A
Current @ +12V	5.5 A	Current @ +12V	2A
Current @ -12V	0.5A	Current @ -12V	1A

NOTE:

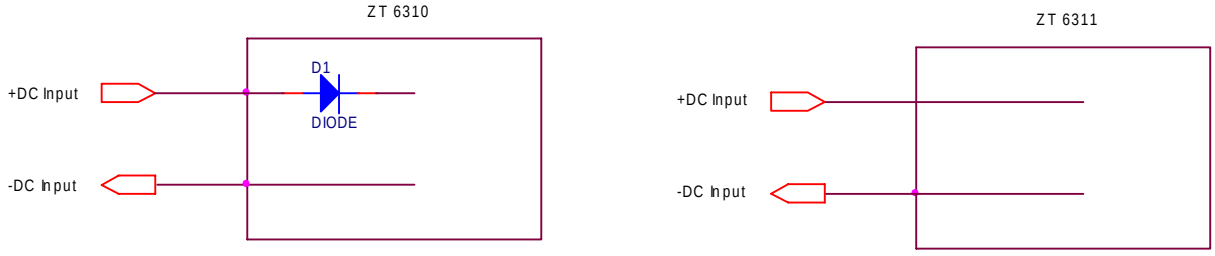
[1] The combined current of +3.3V and +5V must not exceed 25A and the overall output power delivered to the load is not to exceed 150W.

1.7 Reverse Polarity Protection

Reverse polarity protection is provided internally in some enclosures. Performance Technologies DC version ZT 5210 and ZT 508X enclosures have this feature designed in to prevent misconnection damage. Using the ZT 6311 in these platforms assures correct setup and assembly for operation.

Some systems wire the DC input directly to the backplane (and the power supply). Correct connections at the + and – poles is an absolute requirement.

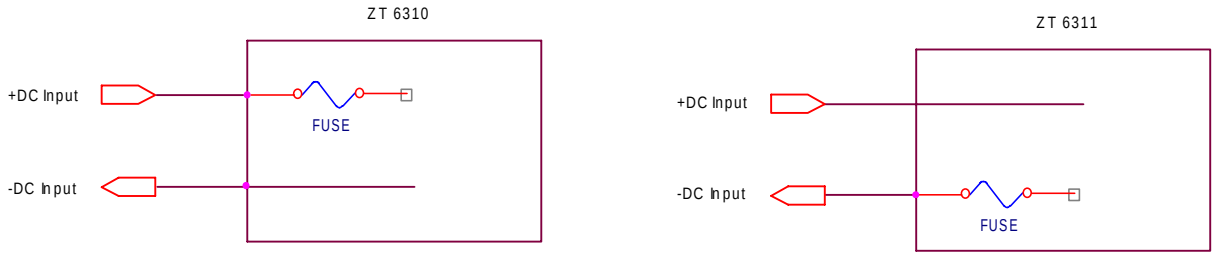
NOTE: The ZT 6311 DC supplies do not have built-in reverse polarity protection, as shown in the figure below. Check polarity connections carefully! A -48V external voltage source connected to the +DC input while using an installed ZT 6311 will damage the ZT 6311, create a safety/fire/electric hazard, or both!



1.8 Input Short Circuit Protection

The ZT 6310 has its internal input protection on the +DC input. Take care when using a -48V external input. *In the event of an internal ground fault, damage will occur until an external breaker or fuse on the -48V line opens.* Short circuit problems are avoided when the supply is used in a line protection enclosure. Performance Technologies provides this power line protection in our ZT 5210 and ZT 508X series enclosures.

The ZT 6311 has input protection circuitry on the -DC input. When +DC voltages power these supplies, we strongly recommend line protection. See below:



Section

2 Specifications

The ZT 6301 and ZT 6311 are compliant with the CompactPCI Specification, PICMG 2.0, version 2.1

2.1 Electrical Specifications

Input Specifications

Input Voltage Range:

ZT 6301:	90-254VAC
ZT 6311: 36-72VDC	
Input Filter Type:	Common and Differential mode

Input Current

Maximum Continuous:

ZT 6301:	2.2A @ 115VAC
ZT 6311:	4.5A at 48VDC
Single Cycle, Surge Maximum (ZT 6301):	<10A
Power Factor (ZT 6301):	Yes, >.99
Cold Start, Surge Maximum (ZT 6311):	10A (typically 110% of the static source current, lasting <20ms)

2.2 Output Specifications

Total Voltage Accuracy (load, cross and line regulation across temperature):

+3.3V* @ 20A	±2%
+5V @25A (2A minimum)[1]	±2%
+12V @ 5.5A	±2%

-12V @ 0.5A	±4%
Total Output Power (max. continuous @ 35° C with 15cfm):	150W

NOTE:

[1] Combined current not to exceed 25A

Ripple and Noise

The following specifications were measured at full load with 20 MHz bandwidth and 22µF capacitor at load, or with 50mV, whichever is greater:

+3.3V	<1.0% P-P
+5V	<1.0% P-P
+12V	<1.0% P-P
-12V	<1.0% P-P
Short Circuit Protection:	Auto recovery
Overvoltage Protection:	135% maximum (+3.3V, +5V)
Hold-Up Time (ZT 6301):	12ms @ 90V input (full load)
Turn-On Time (ZT 6311):	<1s

2.3 General Specifications

Efficiency:	> 69% typical at 20 to 80% maximum load

2.4 Environmental Specifications

Operating Temperature:	0° to 70° Celsius
Storage Temperature:	-40° to +85° Celsius
Non-Condensing Relative Humidity:	less than 95% at 40° Celsius
Overtemp Shutdown:	yes, with output shutdown
Cooling Requirement:	See figure below

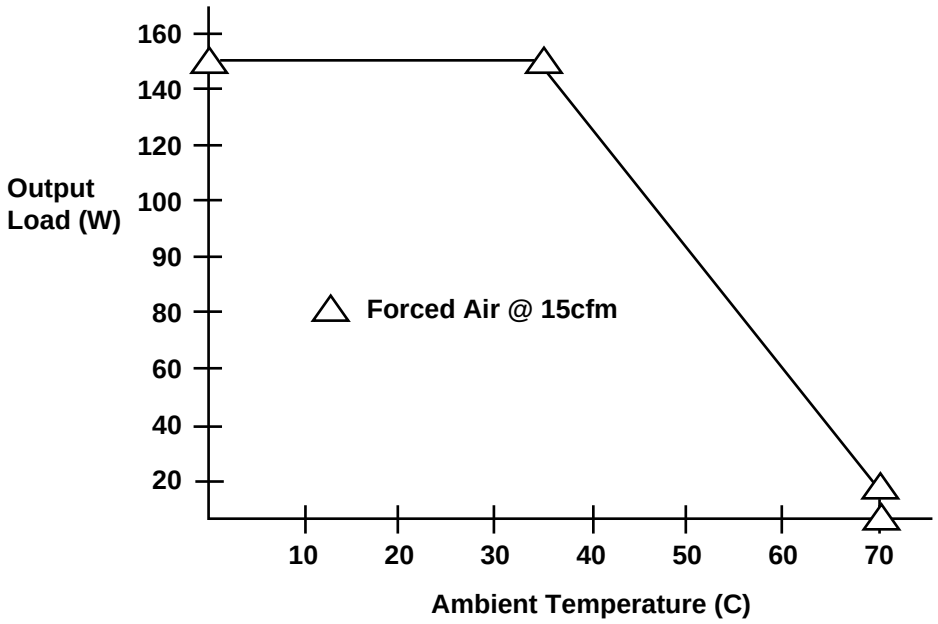


Figure 2. Output Derating Curves For Various Air Flows

NOTE: Cooling requirements at sea level. Derate output load in the figure by 15% per 6,000 feet.

Shock and Vibration (pending):	MIL-STD-810E
Vibration, Operating (pending):	20 to 2000 Hz @ 0.01g^2/Hz
Vibration, Non-Operating (pending):	20 to 2000 Hz @ 0.01g^2/Hz
Shock, Operating:	15g @ 3ms
Shock, Non-Operating:	2.48lbs @ 6ms
Altitude:	21,000 feet (6.4 Km)
Weight:	2.48 lbs (1.12 Kg)

2.5 Reliability

MTBF:	400,000 hours per the BellCore RQGR method
MTTR:	Five minutes (based on module replacement)

2.6 Mechanical Specifications

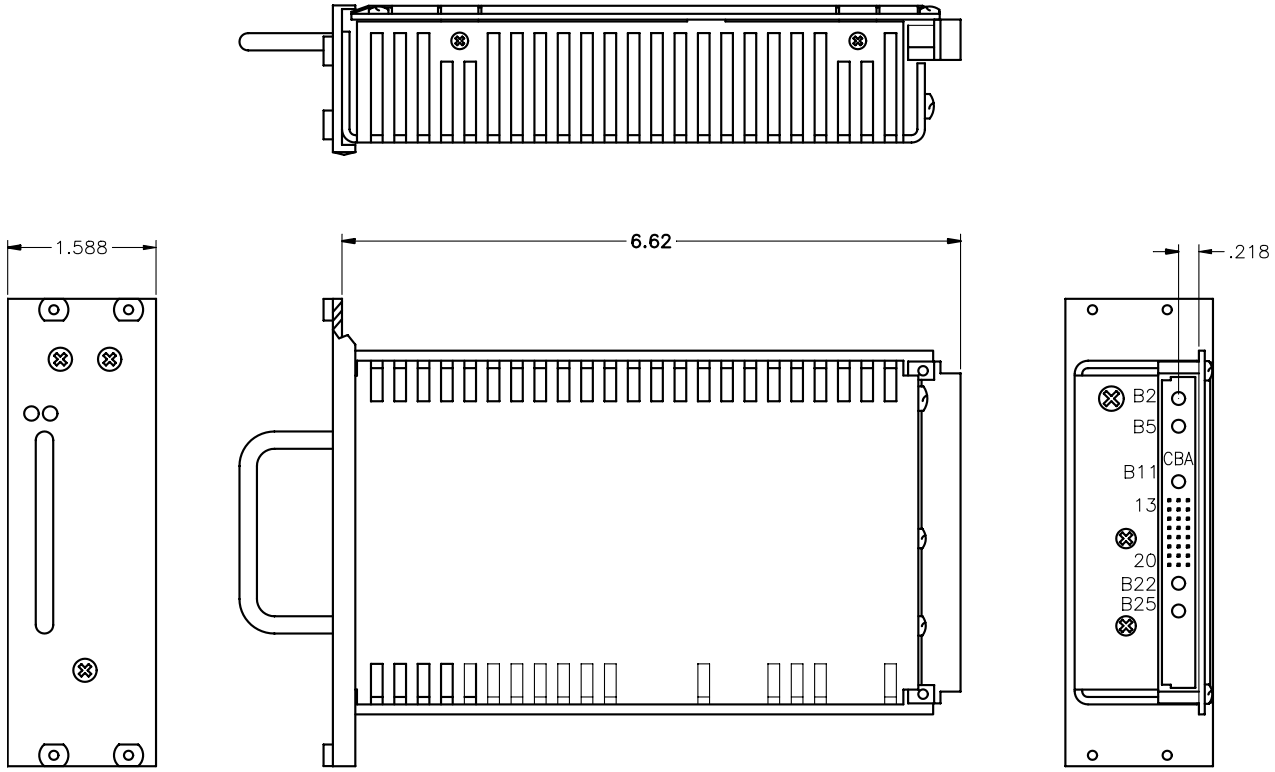
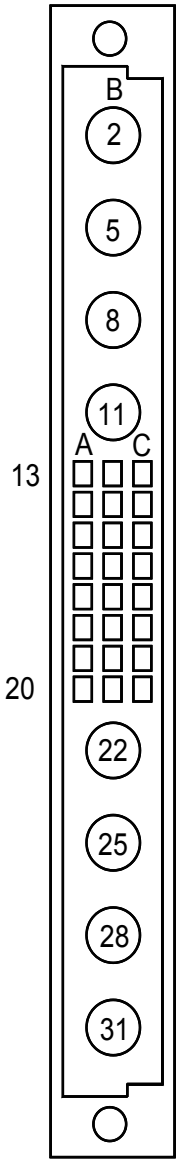


Figure 3. Dimensions

Table 2. Mating Connector (top view)

Pin #	Staging	Mnemonic	Description
Column A			
A13	EL	SP	Spare (do not connect)
A14	EL	INH#	Inhibit Signal
A15	EL	ISH	Current Share Signal
A16	EL	S-	Sense -
A17	EL	5S+	5V Sense +
A18	EL	3.3S+	+3.3V Sense
A19	EL	+12V	+12 VDC
A20	EL	-12V	-12 VDC
Column B			
B2	SL	ACL	AC Line (ZT 6301)
B5	SL	ACN	AC Neutral (ZT 6301)
B8	—	—	No Pin Loaded
B11	EL	CG	Chassis Ground
B13-18	SL	3.3V	+3.3VDC
B19	SL	+12V	+12VDC
B20	SL	-12V	-12VDC
B22	EL	5V	+5VDC
B25	EL	GND	Ground
B28	SL	+DC	+DC Input (ZT 6311)
B31	SL	-DC	-DC Input (ZT 6311)
Column C			
C13	SL	EN#	Enable Signal
C14	SL	DEG#	Temp. Warning Signal
C15	SL	FAL#	Supply Fail Signal
C16-18	SL	3.3V	+3.3VDC
C19	SL	+12V	+12VDC
C20	SL	-12V	-12VDC



Pin numbers illustrated are the pin view of the female mating connector. A mating connector is ERNI part #914374; AMP #148370-1 or #97-7200-016.

Signal Descriptions

+5V The primary DC output of the power supply capable of providing 2.5-25A. This output must have a minimum load of 100mA on it to guarantee that the power supply will operate. This output must have a minimum load of 2.5A in order to guarantee that the power supply will provide the maximum current on the auxiliary outputs (+3.3, +12, -12).

+3.3V This is a secondary DC output capable of providing 0-20A.

+12V This is a secondary DC output capable of providing 0-5.5A.

-12V This is a secondary DC output capable of providing up to 0.5A.

GND This is the DC return current path for the power supply outputs.

SP This is a spare pin. This should not be connected on the backplane interface.

5S+ This is the +5V sense pin. This is a high-impedance input to the power supply that monitors the value of +5V output being provided to the system. The power supply will adjust the primary output voltage to accommodate up to 5% of a voltage drop between the power supply and the load. Ideally, backplanes should route this signal to the center of a distributed load.

5S- This is the current return path for the +5V sense pin. Ideally, backplanes should route this signal in parallel with the 5S+ signal to the center of a distributed load.

ACL This is the AC Line pin (ZT 6301). Backplane trace size and spacing is critical in order to meet UL and CSA requirements.

ACN This is the AC Neutral pin (ZT 6301). Backplane trace size and spacing is critical in order to meet UL and CSA requirements.

CG This is the Chassis Ground pin. It must be routed to the chassis (frame) ground in order for the power supply application to meet UL and CSA requirements.

+DC This is the positive DC input (ZT 6311). Backplane trace size and spacing is critical in order to meet UL and CSA requirements. If a -48VDC power source is used, then ground is connected to this input (since it is the more “positive” pin of the input power source).

-DC This is the negative DC input (ZT 6311). Backplane trace size and spacing is critical in order to meet UL and CSA requirements. If a -48VDC power source is used, then the -48VDC pin is connected to this input (since it is the more “negative” pin of the input power source).

INH# Inhibit. This signal is a low true input to the power supply that may be driven by a TTL signal or a switch to ground. Depending on the application, this signal may be tied between multiple supplies and used to globally disable the outputs of all connected power supplies. An internal pull-up allows the power supply to operate

normally if this signal is left unconnected (floating). Maximum Iol current on this pin is 50uA.

EN# Enable. This signal is a low true input to the power supply that is used as a last-mate/first-break connection. This allows the power supply to be hot swapped by disabling the outputs prior to the power contacts breaking their connection (removal). The power supply outputs remain disabled until the unit is fully seated (insertion). This signal should be tied to logic ground on the backplane. Maximum Iol current on this pin is 30uA.

DEG# Degrade. This signal is a low true output from the power supply that can be used to notify the system of an overtemperature condition within the power supply. This signal is generated when the power supply is within 20ºC of thermal shutdown. Maximum Iol current on this pin is -5mA.

FAL# Fail. This signal is a low true output from the power supply that can be used to notify the system of an output failure (out of tolerance condition). This signal is generated when the AC power supply (ZT 6301) senses a 10% drop or a failure on +5V or +3.3V. On the DC power supply (ZT 6311), all four outputs are monitored. On the AC power supply (ZT 6301), this signal is also used to notify the system of an AC input power failure. In this case, the FAL# signal will be driven low 5ms prior to the outputs falling out of tolerance. In the event of an overvoltage condition or an overtemperature condition, all outputs are disabled and the FAL# signal is asserted. Maximum Iol current on this pin is -5mA.

ISH Load Share. This is a "third wire" current sharing signal that is used by some power supplies to properly regulate the amount of power being delivered to the primary load (+5V). The ZT 6301 and ZT 6311 do not use this signal. Load Sharing is accomplished with the ZT 6301 and ZT 6311 using the Programmed Slope Method where each supply adjusts its outputs based on the current being delivered to the load. This adjustment occurs within 1% of the tolerance band.

Section

3 Agency Approvals

NOTE: Always connect chassis ground (CG) on the supply to earth ground through a low impedance path.

UL 1950

CSA 22.2 #234

IEC 950 and TUV

EN60950, Class 1 SELV., CE 72/23/EEC/93/68EEC (low voltage directive)

Conducted RFI: Meets FCC Part 15, Subpart J, Class A; EN55022 Class B; CISPR 22 Class B

Section
4

Power Supplies and Hot Swap Circuitry

Performance Technologies hot swap products are essentially electrically isolated from the backplane when installed or removed. This prevents transients from corrupting backplane communication when a product is removed or installed while the system is operating.

This circuitry has several consequences in the way in which the boards power up. One is the ability of the circuit to monitor the power supply voltages necessary for proper operation of the product. Until the proper voltages are present, the board will not power up. This creates a concern when using power supplies that require a minimum load to start up.

4.1 The Power Supply Perspective

Performance Technologies hot swap power supplies have two different minimum load requirements for the primary output to operate properly. The first requirement is the 100mA load necessary for the power supply to start up. The second minimum load requirement is the regulation requirement and must be met to guarantee that the auxiliary outputs of the power supply regulate properly if they are fully loaded when the primary output is not.

These requirements should be met for EACH SUPPLY in the system. In a hot swap system with four power supplies, a *minimum* load of 400mA on the +5V output must be present to guarantee that the power supplies start up properly. In a hot swap system, it is the minimum start up load requirement that is of concern.

In a pure hot swap system, the power supply essentially sees no load even after the input power to the system is applied. This is because the hot swap circuitry remains disabled until the voltage levels reach the appropriate value. The power supply never generates the proper voltage until it sees a load. They both wait for each other and the system never powers up.

When configuring a pure hot swap system, minimum start up loads for the power supply must be considered. This can be accomplished in a number of ways. The most direct solution is to include a simple power resistor in the system to provide the start up load necessary for the supply.

Section

5 In Case of Difficulty

If you encounter difficulty in using this Performance Technologies product, you can contact our support personnel in several ways. Please have the product model and serial number handy before contacting Product Support.

Internet

www.pt.com

Email

ztsupport@pt.com

Describe your problem in detail. Please include your return email address and telephone number.

FAX

(805) 541-5088

Mark your FAX “Attention: Product Support.” Describe your problem in detail. Please include your return FAX number and telephone number.

Telephone

(805) 541-0488

Request Product Support. Our offices are open between 8:00 am and 5:00 pm Pacific Time, Monday through Friday.

If you are located outside North America, we encourage you to contact the local Performance Technologies distributor or agent for support. Many of our distributors or agents maintain technical support staffs.

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